Apparatus and Method for Rectangular-to-Polar Conversion

Abstract

A rectangular-to-polar-converter receives a complex input signal (having X_0 and Y_0 components) and determines an angle ϕ that represents the position of the complex signal in the complex plane. The rectangular-to polar-converter determines a coarse angle φ_1 and a fine angle φ_2, where $\varphi = \varphi_1 + \varphi_2$. The coarse angle φ_1 is obtained using a small arctangent table and a reciprocal table. These tables provide just enough precision such that the remaining fine angle φ_2 is small enough to approximately equal its tangent value. Therefore the fine angle φ_2 can be obtained without a look-up table, and the fine angle computations are consolidated into a few small multipliers, given a precision requirement. Applications of the rectangular-to-polar converter include symbol and carrier synchronization, including symbol synchronization for bursty transmissions of packet data systems. Other applications include any application requiring the rectangular-to-polar conversion of a complex input signal.

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